The role of temperature on the tidal deformability of an inspiraling binary neutron star system

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The detection of gravitational waves emitted by binary neutron star mergers consists a very promising tool for studying the properties of dense nuclear matter. The lack of exact evidence for a zero-temperature scenario regarding the inspiral phase of a coalescing binary neutron star system raises the question of the role of temperature. Based on some theoretical studies, the existence of temperature (about a few MeV) before the merger is possible. The main goal of our work is to study the thermal effects on the tidal deformability of neutron stars, by taking into consideration the observations of binary neutron star mergers [1]. In our study, we used various hot equations of state, both isothermal and adiabatic, and for different nuclear models. The main finding is that for temperature below 1 MeV the tidal deformability as a function of the neutron star mass remains insensible. In the adiabatic case, this behavior is present up to entropy per baryon $S=0.2\ k_B$.

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